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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/611,416	07/01/2003	George Allen	H00498.70170.US	1935
7590 07/14/2004				
Timothy J. Oyer, Ph.D. Wolf, Greenfield & Sacks, P.C. 600 Atlantic Avenue Boston, MA 02210		EXAMINER GAKH, YELENA G		
		ART UNIT PAPER NUMBER 1743		

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/611,416	Applicant(s) ALLEN ET AL.	
	Examiner Yelena G. Gakh, Ph.D.	Art Unit 1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-84 is/are pending in the application.
- 4a) Of the above claim(s) 47-61, 83 and 84 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-46 and 62-82 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>11/03/03</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-46 and 62-82, drawn to a method for continuous determination of sulfates, classified in class 436, subclass 122.
  - II. Claims 47-61 and 83-84, drawn to an apparatus for continuous determination of sulfates, classified in class 422, subclass 82.08.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for detecting sulfur dioxide rather than sulfates.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Stephen Finch on 07/02/04 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-46 and 62-82. Affirmation of this election must be made by applicant in replying to this Office action. Claims 47-61 and 83-84 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

*Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-46 and 62-82 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 62 recite, “a method comprising”, without defining, which specific method is claimed in the invention. It is unclear, if this is the method for determining concentration of sulfate, or detecting sulfur dioxide, which is obtained from sulfur dioxide. The lack of a definition for the method in the preamble of the claim renders the claims unclear and indefinite. The title of the invention reads, “method and apparatus for measurement of sulfate”. If the method is directed toward measurement of sulfate, it should be said so in the preamble of the claims.

Claim 1 recites, “providing a sample comprising sulfate; converting at least a portion of the sulfate to sulfur dioxide; and continuously determining the sulfur dioxide”. It is not clear from the claim, how is it possible to continuously determining sulfur dioxide, if a discrete sample comprising sulfate is provided and instantaneously converted into sulfur dioxide? What the continuity of the measurement is based on? Sulfur dioxide can be continuously measured only if sulfate is continuously provided and continuously converted into sulfur dioxide. Otherwise, the first two steps and the last step of the claimed method contradict each other.

Further, since no amount or concentration of sulfur dioxide is recited in the last step, it is not clear, if determination of the last step just means detecting the presence of sulfur dioxide, or it actually refers to determining the amount of sulfur dioxide. “Determining” in the specification is defined as including “detecting”. In this case the essence of the method recited in claim 1 is not clear: if the sample comprising sulfate is provided and at least a portion of it is converted into SO<sub>2</sub>, then what is the point of detecting SO<sub>2</sub>, which is for sure will be present in the sample?

Moreover, since it is not clear, which specific method is recited in the claim, it is not apparent, if there should be any step relating determined sulfur dioxide and sulfate. This renders

Art Unit: 1743

the claims indefinite regarding the steps involved in the method claimed. Also, since the method is presumably for measurement of sulfate, as can be concluded from the title, then it is not clear, how sulfate can be measured if only a portion of sulfate is converted into sulfur dioxide, and the portion is not known.

Claim 16 is not clear. How is it possible to remove “*at least a portion of any particulate matter*” to produce “a background sample *essentially free of particulate sulfate*”? To produce such background, essentially **all** particulate sulfur matter should be filtered off.

Claims 75 and 76 refer to PM 10 and 2.5. Referring to the particle sizes, such as less than 10 or 2.5 micron is preferable.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1-8, 12-33, 35, 37-38, 41-42, 62, 64, 67-73 and 75-82** are rejected under 35 U.S.C. 102(b) as being anticipated by Roberts et al. (Atmospheric Environment, 1976, IDS, corrected journal title and year from Abstract).

Roberts teaches “analysis of sulfur in deposited aerosol particles by vaporization and flame photometric detection” (Title). The method includes collecting sulfur samples, particularly ammonium sulfates and sulfuric acid, on stainless steel strips, reducing at least a part of the samples to SO<sub>2</sub> at temperature of ~1200 °C by heating stainless steel plates and measuring SO<sub>2</sub> concentration to obtain a sulfur content of the samples. All sulfur compounds convert into SO<sub>2</sub> at this temperature (page 405, left column), decomposing completely (~100%). Glass fiber filters are used for total filter collection pretreated for removing the background sulfur (page 404, right column). Blank spectra are run for various substrates (Table 1), with the blank spectra subtracted from the measured spectra as a background.

Art Unit: 1743

7. **Claims 1-5, 11-15 and 18-20** are rejected under 35 U.S.C. 102(b) as being anticipated by Slanina et al. (Anal. Chem., 1985, IDS).

Slanina teaches “determination of sulfuric acid and ammonium sulfates by means of a computer-controlled thermodenuder system”, comprising sampling particulate sulfuric acid and ammonium sulfates in air “by means of two CuO coated denuder at to of 120 and 240 °C, respectively. The tubes are heated to 800 °C and the liberated SO<sub>2</sub> is measured by means of a flame photometric detector”. Slanina emphasizes that this method is more advanced comparing to conventional detection of scrubbed sulfates, since SO<sub>2</sub> can be measured by “a large number of analytical methods, such as coulometry, flame ionization spectrometry, **pulsed fluorometry**, and infrared spectrometry, are available”. “The absorbed sulfate is converted to SO<sub>2</sub> quantitatively by heating the tube to a temperature of 800 °C” (page 1956, left column). “The detection limit in terms of concentrations is a function of the sampling time. ... If the sampling time is 5 min, the sulfates present in 2.5 L of ambient air are detected in a volume of 100 mL, so the “enrichment factor” is 25” (page 1959, left column).

### ***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1743

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. **Claim 44** is rejected under 35 U.S.C. 103(a) as being unpatentable over Slanina.

While Slanina does not specifically teach CuO coating as a powder, it would have been obvious for anyone of ordinary skill in the art to use pressed powder for reducing catalyst, since it has much better adsorption properties.

12. **Claims 34, 46 and 65** are rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts.

While Roberts does not specifically disclose the size of removed particles, it would have been obvious for anyone of ordinary skill in the art to adjust filters so that only small particles less than 2.5 microns passed, as it is known that smaller sulfur particles are mostly health hazardous.

While Roberts does not specifically teach stainless steel tubes, it would have been obvious for anyone of ordinary skill in the art to use tubes instead of plates, because this is a conventional shape of pyrolyzers.

13. **Claims 11 and 36** are rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts in view of the well-known technique disclosed e.g. by Zolner in 1974.

Roberts does not teach determining sulfur dioxide by applying pulsed fluorescence. Pulsed fluorescence is a well-established and old method for determining sulfur dioxide, as taught by Zolner. Therefore, it would have been obvious for anyone of ordinary skill in the art to apply well-established pulsed fluorescence method for detecting sulfur dioxide instead of the detection method applied by Zolner, because it allows precise and continuous detection of SO<sub>2</sub>.

14. **Claim 66** are rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts in view of Huntzicker et al. (Atmospheric Environment, 1978, IDS).

Art Unit: 1743

While Roberts does not specifically teach pretreatment of the sample with ammonia, Huntzicker discloses "continuous measurements and speciation of sulfur-containing aerosols by flame photometry", comprising pre-treating samples with ammonia for converting sulfuric acid into ammonia sulfate. It would have been obvious for any routineer in the art to introduce the step of pre-treating the sample with ammonia taught by Huntzicker in Roberts's method because of the reasons indicated by Huntzicker, i.e. because ammonia sulfate is much easier controlled in the method than sulfuric acid.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (571) 272-1257. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Yelena G. Gakh  
7/9/04

